REMARKS

Generally

The OA does not state a *prima facie* case of non-enablement under 35 USC §112, first paragraph. The rejection is based on incorrect assertions that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art "to select a non-subject term."

The OA does not state a *prima facie* case of lack of written description under 35 USC §112, second paragraph. The rejection is based on incorrect assertions that claim terms *non-subject term* and *implicit position* are neither defined in the application nor known to those skilled in the art.

The OA does not state a *prima facie* case of anticipation under 35 USC §102. The rejection is based on incorrect assertions that the reference discloses the use association of a *sense* of a *subject term* with *clusters* in a latent semantic vector space as claimed.

The OA does not state a *prima facie* case of obviousness under 35 USC §103. In addition to the incorrect assertions that serve as the basis for the anticipation rejections, the obviousness rejection is based on the incorrect assertion that a secondary reference discloses the use of a term-by-document matrix, and that the secondary reference provides motivation for the use of such matrix as claimed.

Prior to specific statutory rejections, the OA asserts:

> The specification does not support the claimed "non-subject terms."

Subject term is clearly identified in the written description as the term for which word sense disambiguation (e.g., sense discrimination, sense tagging) is to be performed. *See e.g.,* P08 L01-05 (highlight added):

> *SUMMARY OF THE INVENTION Preferred embodiments of the present invention include systems and methods for word sense disambiguation, including discerning one or more senses or occurrences of a term, distinguishing between senses or occurrences, and* ***determining a meaning for a sense or occurrence of a subject term.***

See P20 L15-19 (highlight added)

> *The programming then determines at least one cluster of documents within the vector space, each cluster corresponding to a subset of documents within the space that containing a subject term. The implicit position within the vector space of at least one sense of the* ***subject term*** *is determined as described above.*

"Non" is a well known English language prefix defined and explained in most every English language dictionary, e.g.:

> **non-**. Indicates not. *The American Heritage Dictionary of the English Language*, 892 (William Morris Ed., Houghton Mifflin 1976).

> **Negatives. A. Negative Prefixes.** The primary negative prefixes in English are *in-* ... *un-*, *non-*, and *anti-*... *Non-* is the broadest of the prefixes, since it may precede virtually any word. It often contrasts with *in-* or *un-* in expressing a nongradable contrast, rather than the opposite end of a scale - e.g.: *nonscientific* (= concerned with a field other than science) ... Bryan A Garner, *A Dictionary of Modern American Usage*, 446 (Oxford University Press 1998).

Non-subject term plainly refers to terms that are **not** the subject of disambiguation; or stated another way, terms that **other than** the subject term.

Regarding Rejections Under 35 USC §112 First Paragraph

The OA does not state a *prima facie* case of non-enablement under 35 USC §112, first paragraph. The rejection is based on an incorrect assertion that the claims contain subject matter which was not described in the specification in such a way as to enable one skilled in the art "to select a non-subject term."

The proper test for enablement under 35 USC §112 first paragraph is stated by the CAFC as:

> The question is whether the disclosure is sufficient to enable those skilled in the art to practice the claimed invention, hence the specification need not disclose what is well known in the art. Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 221 USPQ 481 (Fed. Cir. 1984) (citing *In re* Myers, 410 F.2d 420, 161 USPQ 668 (C.C.P.A. 1969).

Consider the specific claim language. Specifically for Claims 4 and 5, the OA cites the following claim language:

> ... *discerning at least one* ***non-subject term within the vicinity of the implicit position of the sense*** *and assigning the meaning associated with the term in the reference collection that correlates best with the discerned* ***non-subject term closest to the implicit position of the sense.***

For Claim 7:

> ... *assigning to the occurrence, the meaning, associated with the subject term in the reference collection, that correlates best with* ***non-subject terms closest to the implicit position.***

For Claim 8:

> ... *discerning* ***at least one non-subject term within the vicinity of the implicit position of the sense*** *and assigning to the sense having a discerned implicit position, the meaning, associated with the term in the reference collection, that correlates best with* ***the discerned non-subject terms closest to the implicit position of the sense.***

Each claim refers to only two types of *non-subject terms*, i.e., those:

- *in the vicinity of the implicit position of a sense*, and those
- *closest to the implicit position of a sense.*

Methods for identifying terms (whether a *subject term* or *non-subject term*) that is *within the vicinity of* or *closest to* a point (in this case, *the implicit position of a sense*) in the LSI space were well known to those skilled in the art at the time of the invention. These methods include the dot product between the vectors of the term and the point, and the cosine of the angle between the vectors. That these are well known is evidenced by the fact that both methods are

disclosed in U.S. Patent 4,839,538 ('538) to Deerwester et al, issued 06/13/1989. *See* '538 C06 L58 – C08 L24.

Regarding Rejections Under 35 USC §112 Second Paragraph

The OA asserts with regard to Claim 1:

> The scope of the present invention is difficult to determine because examiner maintains the most basic query will reveal at least one sense of the subject term. Related prior art concerns "subject terms" which have multiple meanings. Obviously, searching becomes more complicated if the "subject terms" have multiple meanings. In fact the prior art cited by examiner, i.e., Gallant `507 teaches a method for word sense disambiguation [col 3, lines 21-25].

While Claim 1 has been amended to more particularly point out and distinctly claim the subject matter that the applicant regards as his invention (as will be explained below), two points should be noted regarding the above assertion. First, the most basic prior art query will **not** reveal at least one sense of a term. In the BACKGROUND OF THE INVENTION, the application repeatedly discloses examples and references showing that known information retrieval methods do not adequately address sense discernment, discrimination, or tagging. While a traditional query will return documents that contain at least one sense of a term, traditional queries will not discern between senses of the term.

Second, Gallant '507 does not teach a method for word sense disambiguation as claimed. Specific patentable difference exist between Gallant '507 and the claimed invention. These difference are addressed herein with respect to specific prior art rejections.

The OA next asserts with regard to Claims 1-14, 16 and the use of *implicit position* that:

> The inclusion of "implicit position" <in each of these claims> does not distinctly claim the present invention. Implicit is defined as "suggested or to be understood though not plainly expressed." It is unclear where the position of the subject term occurs within the cluster of

> documents ... For purposes of this Office Action the word "implicit" will be ignored.

As a preliminary matter, Claim 15 also uses the words *implicit position*:

> *... the sense position module operative to determine an* ***implicit position*** *within the vector space of at least one sense of the subject term, the* ***implicit position*** *corresponding to at least one determined cluster.* <emphasis added>.

Two principles are well-established regarding rejections under 35 USC § 112 second paragraph. First, the claims must be read in light of the specification. *See e.g.*, *Ex parte* Wu, 10 USPQ2d 2031, 2033 (B.P.A.I 1989). Second, an inventor may act as his own lexicographer. *See e.g.*, Lear Siegler, Inc. v. Aeroquip Corp., 733 F.2d 881, 221 USPQ 1025, 1031 (Fed.Cir. 1984).

Each use of *implicit position* in the application refers to the implicit position of a **sense** of a term. The application defines the *implicit position* of a *sense* at P13 L23 – P14 L05 as follows:

> *For each cluster that is detected, we can associate an implicit position in the LSI space corresponding to the individual sense of the term of interest that dominates that cluster.* ***This implicit position is simply the geometric average of the locations of the documents from the cluster that contain the term.*** *The document location is used because there may be more than one occurrence of the given term in a particular document. Using the document locations keeps this operation consistent with the others that have taken place in creating the space. It is important to maintain the proper position of these disambiguated terms with respect to all the other terms. Figure 9 shows the application of this process, arbitrarily labeling the senses of "strike" in the example as "strike*1" 610, "strike*2" 620, and "strike*3" 630. These implicit positions of the individual identified word senses can be used in several important ways, as demonstrated below.* <emphasis added>

Next, the OA asserts with regard to Claims 4, 5, 7, and 8 and the use of *non-subject terms* that:

> Claims 4, 5, 7 and 8 include "non-subject terms" which by definition is indefinite for failing to distinctly claim the subject matter which the applicant regards as the invention.

As remarked above, each claim refers to only two types of *non-subject terms*, i.e., those:

- *in the vicinity of the implicit position of a sense*, and those
- *closest to the implicit position of a sense.*

Methods for identifying terms (whether a *subject term* or *non-subject term*) that is *within the vicinity of* or *closest to* a point (in this case, *the implicit position of a sense*) in the LSI space were well known to those skilled in the art at the time of the invention. These methods include the dot product between the vectors of the term and the point, and the cosine of the angle between the vectors. That these are well known is evidenced by the fact that both methods are disclosed in U.S. Patent 4,839,538 ('538) to Deerwester et al, issued 06/13/1989. *See* '538 C06 L58 – C08 L24.

Regarding Rejections Under 35 USC §102 – Anticipation by US Patent No 5,317,507 to Gallant (GALLANT)

The OA makes three assertions with regard to Claim 1 being anticipated by GALLANT:

> Gallant `507 discloses:
>
> · determining at least one cluster of documents within the vector space [Fig 1, item 12 and col 5, lines 35-53],
>
> · each cluster corresponding to a subset of documents within the vector space containing a subject term [Fig 1, item 16],
>
> · determining a position within the vector space of at: least one sense of the subject term the implicit position corresponding to at least one determined cluster [Fig 1, items 18/19, Fig 1, item 22].

Taking these assertions in order, each is seen to be not supported by the reference.

Regarding the first assertion. the *vector space* in GALLANT is not *a vector space representing the* ***latent*** *semantic content of a collection of documents*, as claimed. GALLANT's vector space relies on context vectors as described in GALLANT at C04 L09 *et seq.*:

> A context vector is a fixed length vector having a component value for each of a plurality of word-based

> features. For using the methods of the present invention, a set of features that are useful for discriminating words and documents in a particular language and domain are required.

The use of external features is inconsistent with the use of the vector space as claimed in Claim 1.

Regarding the second assertion, in GALLANT a cluster of context vectors may not correspond to a subset of documents that contain the *subject term*. For example, for the subject term *strike*, in a space based on context vectors with the sample features shown in GALLANT TABLE 1, it would not be possible to determine if any document in any cluster contains the word strike.

Third, neither Figure 1 nor any other section of GALLANT discloses anything about associating a sense of a subject term with a particular cluster.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on anticipation.

The OA makes an additional assertion with regard to Claim 2 being anticipated by GALLANT:

> Gallant `507 discloses wherein the vector space is a latent semantic indexed vector space [Fig 2, summary vector item 19 and col 5, line 54 through col 6, line 6].

The referenced portions of GALLANT make no mention whatsoever of a latent semantic index (LSI) vector space. LSI is described in the application at P10 L01 – P11 L14. In brief, LSI uses singular value decomposition (SVD) to reduce the dimensionality of a matrix having elements representing the frequency of occurrence of terms in documents of a collection. In the LSI space, every document is located at the geometric average of the terms that the document contains; and every term is located at the geometric average of the documents that contain the term. Embodiments of the present invention utilize clustering in the LSI space to determine the implicit position of a **sense** of those terms having more than one sense.

Contrary to disclosing any elements of the present invention, GALLANT explicitly **teaches against** the use of an LSI space. *See e.g.*, GALLANT C02 L21-26:

> More recently Deerwester et al. (9) have also proposed a method for searching which uses fixed length vectors. However, their method also requires work on the order of at least the square of the sum of the number of documents and the number of terms. This is impractical for large corpora of documents or terms.

and GALLANT C12 L34-37:

> (9) Deerwester, S., Dumais, S. T., Furnas, G. W., Landauer, T. K., Harshman,, R. Indexing by Latent Semantic Analysis, Journal of the American Society for Info. Science, 41(b):391-407, 1990.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on anticipation.

Regarding Rejections Under 35 USC § 103 – Obviousness by GALLANT in view of US Patent No. 6,269,368 to Diamond (DIAMOND).

Regarding Claim 3 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses three of the four clauses of Claim 3:

> Gallant `507 discloses:
>
> · performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space [col 2, lines 43-45]
>
> · determining at least one cluster of documents within the vector space, each cluster corresponding to a subset of documents within the vector space containing a subject term [Fig 1, documents item 12 and col 5, lines 35-53];
>
> · determining a position within the vector space of at least one sense of the subject term, the position corresponding to at least one determined cluster [Fig 1,

> user queries item 18 and summary vector creation item 19 and Fig 1, selected documents item 22].

Taking these assertions in order, each is seen to be not supported by the reference.

First, the referenced portions of GALLANT make no mention whatsoever of a latent semantic index (LSI) vector space:

> Uninteresting words are removed from consideration for the purposes of preparing an easily searchable data base. GALLANT C02 L43-45.

LSI is described in the application at P10 L01 – P11 L14. In brief, LSI uses singular value decomposition (SVD) to reduce the dimensionality of a matrix having elements representing the frequency of occurrence of terms in documents of a collection. In the LSI space, every document is located at the geometric average of the terms that the document contains; and every term is located at the geometric average of the documents that contain the term. Embodiments of the present invention utilize clustering in the LSI space to determine the implicit position of a **sense** of those terms having more than one sense. In fact, as shown above with regard to Claim2, GALLANT explicitly **teaches against** the use of an LSI space.

Second, as shown above with regard to Claim 1, in GALLANT a cluster of context vectors may not correspond to a subset of documents that contain the *subject term*. For example, for the subject term *strike*, in a space based on context vectors with the sample features shown in GALLANT TABLE 1, it would not be possible to determine if any document in any cluster contains the word strike.

Third, neither Figure 1 nor any other section of GALLANT discloses anything about associating a sense of a subject term with a particular cluster.

The OA next asserts that DIAMOND discloses the fourth of four clauses of Claim 3:

> Diamond `368 discloses forming an m by n matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the elements of the claim, and
- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of the claim.

Regarding Claims 10 and 11 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses four clauses of Claims 10 and 11:

Gallant `507 discloses:

- performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space [col 2, lines 43-45];
- determining at least one cluster of documents within the vector space, each cluster corresponding to a subset of the [n+x] documents having at least one occurrence of a subject term [Fig 1, item 12 and col 5, lines 35-53]:,
- discerning the position of at least one sense. of the subject term corresponding to at least one determined cluster [Fig 1, items 18/19 and Fig 1, item 22];
- assigning to at least one sense corresponding to at least one discerned position, the meaning of the subject term closest within the vector space to the position of the sense [claim 16, col 15, lines 42-47]

Taking these assertions in order, each is seen to be not supported by the reference.

Regarding the first assertion, the referenced portions of GALLANT make no mention whatsoever of a latent semantic index (LSI) vector space:

> Uninteresting words are removed from consideration for the purposes of preparing an easily searchable data base. GALLANT C02 L43-45.

LSI is described in the application at P10 L01 – P11 L14. In brief, LSI uses singular value decomposition (SVD) to reduce the dimensionality of a matrix having elements representing the frequency of occurrence of terms in documents of a collection. In the LSI space, every document is located at the geometric average of the terms that the document contains; and every term is located at the geometric average of the documents that contain the term. Embodiments of the present invention utilize clustering in the LSI space to determine the implicit position of a **sense** of those terms having more than one sense. In fact, as shown above with regard to Claim2, GALLANT explicitly **teaches against** the use of an LSI space.

Regarding the second assertion, as shown above with regard to Claim 1, in GALLANT a cluster of context vectors may not correspond to a subset of documents that contain the *subject term*. For example, for the subject term *strike*, in a space based on context vectors with the

sample features shown in GALLANT TABLE 1, it would not be possible to determine if any document in any cluster contains the word strike.

Regarding the third assertion, neither Figure 1 nor any other section of GALLANT discloses anything about associating a sense of a subject term with a particular cluster.

Regarding the fourth assertion, GALLANT Claim 16 states, in relevant part:

> 16. A word sense disambiguation method comprising the steps of:
>
> inputting into a processing system in machine readable form a series of words including and surrounding an ambiguous word in a text; ...
>
> locating in a dictionary of context vectors a context vector for each word ... in said series of words;
>
> combining the context vectors for each remaining word to obtain a summary vector for said series of words;
>
> locating a plurality of context vectors in said dictionary of context vectors corresponding to a plurality of meanings for said ambiguous word; and
>
> **combining said summary vector with each of said context vectors associated with said ambiguous word to obtain a relative distance between each of said context vectors and said summary vector, said relative distances serving as a measure of the relative appropriateness of each of said meanings.** <emphasis added>

GALLANT discloses comparing:

- the context vector for each meaning of the ambiguous word; with
- the summary vector of words that are closest **in the source document** to the ambiguous word.

The present claim calls for assigning:

- the meaning of a particular sense of a word, to
- a particular occurrence of a subject word that is nearest the meaning,

The present claim does not use neighboring words from the source document or neighboring words from the vector space. There is only the occurrence of a subject word and meanings of various senses of the subject word. In the invention as claimed, the meaning of the sense of the subject word that is closest to the occurrence of the subject word is assigned to the occurrence of the subject word.

The OA next asserts that DIAMOND discloses a fifth clause of Claims 10 and 11:

> Diamond `368 discloses forming an m by [n+x] matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the all the elements of Claim 10 or Claim 11 (in fact none of the reference correspond to **any** element of Claim 10), and
- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of Claim 10 or Claim 11.

Regarding Claims 12 and 13 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses three clauses of Claims 12 and 13:

> Gallant `507 discloses:
>
> · performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space [col 2, lines 45-60]
>
> · discerning the position, within the vector space, of an occurrence of a subject term [col 3, lines 3-10];
>
> · assigning to the occurrence, the meaning, associated with the subject term, closest to the position of the sense [col 3, lines 21-33].

Taking these assertions in order, each is seen to be not supported by the reference.

The first referenced portion of GALLANT (C02 L45-60) makes no mention whatsoever of a performing singular value decomposition or dimensionality reduction (both of which are requirements of the claim):

> A context vector assigned to each word remaining in the document is identified from a dictionary of context vectors. A context vector is a fixed length series of component values each representative of a conceptual relationship between a word-based feature and the word to which the vector is assigned. The context vectors are combined for all of the words remaining in the document to obtain a summary vector for that document. The summary

> vector is normalized so as to produce a normalized summary vector and this normalized summary vector is stored. Thus, the entire document has been reduced to a single normalized summary vector which is used to identify the documents in a data base. Searching for an appropriate document is done through the data base of normalized summary vectors. GALLANT C02 L45-60.

The second referenced portion of GALLANT (C03 L03-10) discloses construction of a query vector for mapping a query into GALLANT's vector space (which is not an LSI space). This approach would **not** result in finding the location of a single **occurrence** of a term; it would result in determining the geometric average of **all occurrences** of the subject term in the space. Therefore, the approach described at C03 L03-10 of GALLANT would be inoperative for location of a sense of the subject term (and hence inoperative for assigning a meaning to that sense).

The third referenced portion of GALLANT (C03 L21-33) discloses comparing:

- the context vector for each meaning of the ambiguous word; with
- the summary vector of words that are closest **in the source document** to the ambiguous word.

The present claim calls for assigning:

- the meaning of a particular sense of a word, to
- a particular occurrence of a subject word that is nearest the meaning,

The present claim does not use neighboring words from the source document or neighboring words from the vector space. There is only the occurrence of a subject word and meanings of various senses of the subject word. In the invention as claimed, the meaning of the sense of the subject word that is closest to the occurrence of the subject word is assigned to the occurrence of the subject word.

The OA next asserts that DIAMOND discloses a fourth clauses of Claim 12 and 13:

> Diamond `368 discloses forming an m by [n+x] matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the all the elements of Claims 12 and 13, and
- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of Claim 12 or 13.

Regarding Claim 14 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses three clauses of Claim 14:

> Gallant `507 discloses:
>
> · performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space [col 2, lines 45-60];
>
> · determining at least one cluster of documents within the vector space, each cluster corresponding to a subset of documents within the vector space containing a subject term [col 3, lines 3-10 and col 3, lines 34-42].
>
> · determining a position within the vector space of at least one sense of the subject term, the position corresponding to at least one determined cluster [col 3, lines 21-33].

Taking these assertions in order, each is seen to be not supported by the reference.

The first referenced portion of GALLANT (C02 L45-60) makes no mention whatsoever of a performing singular value decomposition or dimensionality reduction (both of which are requirements of the claim):

> A context vector assigned to each word remaining in the document is identified from a dictionary of context vectors. A context vector is a fixed length series of component values each representative of a conceptual relationship between a word-based feature and the word to which the vector is assigned. The context vectors are combined for all of the words remaining in the document to obtain a summary vector for that document. The summary vector is normalized so as to produce a normalized summary vector and this normalized summary vector is stored. Thus, the entire document has been reduced to a single normalized summary vector which is used to identify the documents in a data base. Searching for an appropriate document is done through the data base of normalized summary vectors. GALLANT C02 L45-60.

One portion of GALLANT (C03 L03-10) referenced with respect to the second clause discloses construction of a query vector for mapping a query into GALLANT's vector space (which is not an LSI space). This approach would **not** result in finding the location of a single **occurrence** of a term; it would result in determining the geometric average of **all occurrences** of the subject term in the space. Therefore, the approach described at C03 L03-10 of GALLANT would be inoperative for location of a sense of the subject term (and hence inoperative for assigning a meaning to that sense). The other portion of GALLANT (C03 L34-42) referenced with respect to the second clause discloses storing summary vectors in cluster trees. The same summary vectors disclosed in C03 L03-10 that are inoperative to locate a single occurrence.

The portion of GALLANT (C03 L21-33) referenced with respect to the third clause discloses comparing:

- the context vector for each meaning of the ambiguous word; with
- the summary vector of words that are closest **in the source document** to the ambiguous word.

The present claim calls for assigning:

- the meaning of a particular sense of a word, to
- a particular occurrence of a subject word that is nearest the meaning,

The present claim does not use neighboring words from the source document or neighboring words from the vector space. There is only the occurrence of a subject word and meanings of various senses of the subject word. In the invention as claimed, the meaning of the sense of the subject word that is closest to the occurrence of the subject word is assigned to the occurrence of the subject word.

The OA next asserts that DIAMOND discloses a fourth clauses of Claim 14:

> Diamond `368 discloses forming an m by [n+x] matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the all the elements of Claim 14, and
- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of Claim 14.

Regarding Claim 15 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses four clauses of Claim 15:

Gallant `507 discloses:

- a computer-readable medium [Fig 1, item 20];
- a singular value decomposition and dimensionality reduction module stored on the medium and coupled to the matrix forming module, the singular value decomposition and dimensionality reduction module operative to form a latent semantic indexed vector space from the matrix [col 2, lines 45-60]
- a clustering module stored on the medium the clustering module operative to determine at least one cluster of documents within the vector space, each cluster corresponding to a subset of documents within the vector space containing a subject term [col 2, lines 61-68];
- a sense position determining module stored on the medium, the sense position module operative to determine an implicit position within the vector space of at least one sense of the subject term, the implicit position corresponding to at least one determined cluster [col 3, lines 21-41].

Regarding the second assertion, the referenced portion of GALLANT (C02 L45-60) makes no mention whatsoever of a performing singular value decomposition or dimensionality reduction (both of which are requirements of the claim):

> A context vector assigned to each word remaining in the document is identified from a dictionary of context vectors. A context vector is a fixed length series of component values each representative of a conceptual relationship between a word-based feature and the word to which the vector is assigned. The context vectors are combined for all of the words remaining in the document to obtain a summary vector for that document. The summary vector is normalized so as to produce a normalized summary vector and this normalized summary vector is stored. Thus, the entire document has been reduced to a single normalized summary vector which is used to identify the documents in a data base. Searching for an appropriate document is done through the data base of normalized summary vectors. GALLANT C02 L45-60.

Regarding the third assertion, the referenced portion of GALLANT (C02 L61-68) states:

> In order to further enhance the searching capabilities, a clustering algorithm is used repeatedly for a plurality of levels so as to produce a tree of clustered nodes. A centroid is computed for each node based on the normalized summary vectors assigned to that node by the clustering algorithm. Additional normalized summary vectors are assigned to nodes based on their proximity to the centroids.

In GALLANT a cluster of context vectors may not correspond to a subset of documents that contain the *subject term*. For example, for the subject term *strike*, in a space based on context vectors with the sample features shown in GALLANT TABLE 1, it would not be possible to determine if any document in any cluster contains the word strike.

The fourth referenced portion of GALLANT (C03 L21-41) discloses comparing:

- the context vector for each meaning of the ambiguous word. With
- the summary vector of words that are closest **in the source document** to the ambiguous word.

The present claim calls for assigning:

- the meaning of a particular sense of a word, to
- a particular occurrence of a subject word that is nearest the meaning,

The present claim does not use neighboring words from the source document or neighboring words from the vector space. There is only the occurrence of a subject word and meanings of various senses of the subject word. In the invention as claimed, the meaning of the sense of the subject word that is closest to the occurrence of the subject word is assigned to the occurrence of the subject word.

The OA next asserts that DIAMOND discloses a fourth clauses of Claim 12 and 13:

> Diamond `368 discloses forming an m by [n+x] matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the all the elements of Claims 12 and 13, and
- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of Claim 12 or 13.

Regarding Claim 16 As Rendered Obvious by GALLANT in view of DIAMOND.

The OA asserts that GALLANT discloses four clauses of Claim 15:

Gallant `507 discloses:

- performing singular value decomposition and dimensionality reduction on the matrix to form a latent semantic indexed vector space [col 2, lines 45-60];
- determining at least one cluster of documents within the vector space, each cluster corresponding to a subset of documents within the vector space containing a subject term [col 2, lines 3-10];
- determining an implicit position within the vector space of at least one sense of the subject term, the implicit position corresponding to at least one determined cluster [col 15, lines 43-48].

Regarding the first assertion, the referenced portion of GALLANT (C02 L45-60) makes no mention whatsoever of a performing singular value decomposition or dimensionality reduction (both of which are requirements of the claim):

> A context vector assigned to each word remaining in the document is identified from a dictionary of context vectors. A context vector is a fixed length series of component values each representative of a conceptual relationship between a word-based feature and the word to which the vector is assigned. The context vectors are combined for all of the words remaining in the document to obtain a summary vector for that document. The summary vector is normalized so as to produce a normalized summary vector and this normalized summary vector is stored. Thus, the entire document has been reduced to a single normalized summary vector which is used to identify the documents in a data base. Searching for an appropriate document is done through the data base of normalized summary vectors. GALLANT C02 L45-60.

The second assertion appears to be in error. The referenced portion of GALLANT (C02 C03-10) is wholly unrelated to the clusters containing a subject term. Earlier portions of this Reply address why GALLANT does not disclose the indicated claim language.

Regarding the third assertion, GALLANT Claim 16 states, in relevant part:

16. A word sense disambiguation method comprising the steps of:

inputting into a processing system in machine readable form a series of words including and surrounding an ambiguous word in a text; …

locating in a dictionary of context vectors a context vector for each word … in said series of words;

combining the context vectors for each remaining word to obtain a summary vector for said series of words;

locating a plurality of context vectors in said dictionary of context vectors corresponding to a plurality of meanings for said ambiguous word; and

combining said summary vector with each of said context vectors associated with said ambiguous word to obtain a relative distance between each of said context vectors and said summary vector, said relative distances serving as a measure of the relative appropriateness of each of said meanings. <emphasis added>

GALLANT discloses comparing:

- the context vector for each meaning of the ambiguous word; with
- the summary vector of words that are closest **in the source document** to the ambiguous word.

The present claim calls for assigning:

- the meaning of a particular sense of a word, to
- a particular occurrence of a subject word that is nearest the meaning,

The present claim does not use neighboring words from the source document or neighboring words from the vector space. There is only the occurrence of a subject word and meanings of various senses of the subject word. In the invention as claimed, the meaning of the sense of the subject word that is closest to the occurrence of the subject word is assigned to the occurrence of the subject word.

The OA next asserts that DIAMOND discloses a fifth clause of Claims 10 and 11:

> Diamond `368 discloses forming an m by [n+x] matrix, where each matrix element (i, j) corresponds to the number of occurrences of term i in document j [col 8, lines 53].

The referenced section of DIAMOND states:

> a subject field coder (SFC) 100, with its associated concept category database containing a hierarchy of concept categories for all words, domain knowledge concept category correlation matrix database used to disambiguate concept categories at the domain level, and global knowledge concept category sense-frequency database used to disambiguate concept categories at the global level;

This assertion is not supported by the reference. The referenced section of DIAMOND contains no disclosure whatsoever regarding formation of a matrix where each element corresponds to the number of occurrences of a term in a document. No portion of DIAMOND discloses how a domain knowledge concept category correlation matrix is formed. Further, no other portion of DIAMOND even uses the word "matrix."

Further, the OA asserts, that the motivation for combining DIAMOND and GALLANT would be "for the purpose of structuring the **database**." <emphasis added>

The application does not claim a **database**. Therefore any teaching, suggestion, or motivation to combine DIAMOND and GALLANT (which is not apparent in any case) to structure a database is irrelevant to a claim that requires formation of a matrix having entries representing the frequency of occurrence of terms in a collection of documents.

The undersigned requests that this rejection be withdrawn for failure to state a *prima facie* case on obviousness for at least two reasons:

- the OA cites no references that correspond to the all the elements of Claim 10 or Claim 11 (in fact none of the reference correspond to **any** element of Claim 10), and

- the OA does not cite teaching, suggestion, or motivation to combine the references in a way that corresponds to the elements of Claim 10 or Claim 11.

CONCLUSION

With consideration of the above remarks directed to rejections, the undersigned submits that this application is in condition for allowance, and such disposition is earnestly solicited. If the Examiner believes that the prosecution might be advanced by discussing the application with the undersigned, in person or over the telephone, we would welcome the opportunity to do so.

Respectfully submitted,

Date: May 04, 2004

By: _____

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